

# Mechanical engineering; machining devices research paper examples

[Law](#), [Security](#)



## Part 1

- Describe at least six important H&S factors when using a centre lathe and explain how these factors can be used to reduce risk when machining components

The centre lathe is used to make cylindrical shapes from materials such as steels and plastics. Some of the safety factors to consider when operating a lathe machine include:

- The lathe machine should only be operated by competent persons who fully understand how to use the machine and have gone through safety training about lathes.

- The lathe machine operator must always wear safety goggles whenever operating the machine

- All lathe machines should be fitted with an emergency stop device (foot or knee switches)

- The guard should always be in position during the operation of a lathe

- Only a small distance of the metal being machined should extrude from the chuck. The more lengthy the extrusion, the more the likelihood of an accident occurring

- The material being machined must be tightly secured in the chuck before starting the machine. The Chuck key must also be removed from the chuck.

- Describe the differences between “forming” and “generating” as applied to turning. Use of illustrations will help you achieve this task effectively.

In “generating” the feed trajectory of the cutting tool determines the geometry or shape of the work-piece. In other words it is the movement of the tool and not its shape that determines the resultant shape. In “forming”

the geometry of the cutting tool creates the shape of the work-piece.

Figure 1 showing a generating process

## **Direction of tool movement tools with different shapes**

Figure 2 showing a forming process

## **Formed surface**

Shaping tool

- Describe three work holding devices used on a centre lathe.
  - Explain when fixed and travelling steadies would be used on a centre lathe
- The fixed steady is used when facing and centering a long shaft. It is also used when supporting a work-piece by supporting it at the tailstock centre.
- The travelling steady on the other hand is used when the work-piece requires machining in different portions simultaneously for example when turning and screw-cutting a work-piece.
- List and explain the purpose and safe use of four commonly used turning tools
  - The parting tool-used to sever the work-piece from the stock material once an operator finishes machining. Safe use of this tool requires a back tool-post to eliminate vibrations.
  - Screw-cutting tool-used to cut threads on a work-piece. Safe use of this tool calls for the operator to check the angle of the tool and tighten it accordingly.
  - The Knife tool- found in the form of right or left handed tool. Both are used to perform basic shaping of a work-piece. Caution should be taken with the sharp edges of this tool as well ensure it is rightly secured before starting the

lathe.

- The roughing tool- This is used in the initial stages of machining a work-piece. The operator must put on safety goggles to avoid injuries from the large pieces of flying metal pieces removed by the roughing tool.
- Describe 3 different types of cutting materials and their support and/or clamping mechanisms used for centre lathe turning.
- Lathe tool from solid steel- Both the shank and the cutting head are made from steel. The
- Carbide, cermets and ceramic inserts are mechanically clamped into the seats of rectangular sectioned steel bars mounted in the tool post.
- High Speed Steel (HSS) form and threading tools are usually held in the tool post. They are used in the basic forming processes.

## **Part 2**

- Describe at least 6 important H&S factors when using a milling machine and explain how these factors can be used to reduce risk when machining components.
- Always make sure that the work piece is tightly clamped to prevent it from dislodging from position and injuring the operator or other persons
- The operator should always wear safety goggles to avoid injury to the eyes from metal pieces.
- The operator should avoid loose clothing, ties, jewellery etc that could get caught in the machine moving parts and cause him/her injury
- Only competent personnel knowledgeable on the safe operation of milling machines should operate the milling machine.

- Operator should wipe away any oils and lubricants spilt on the floor around the milling machine to avoid tripping and falling on the machine.
- The milling machine should have an emergency switch to put it off immediately in case of an accident.
- Describe the differences and advantages/disadvantages of “ up-cut” and “ cut-down” milling. Use of illustrations will help you achieve this task effectively.

Figure 2. Up-cut milling Figure 3: Down-cut milling

1 milling cutter, 2 work-part, 3 direction of rotation of cutter (primary motion), 4 feed direction of work-part (secondary motion)

Figure 3: Down-Cut Milling

1 milling cutter, 2 work-part, 3 direction of rotation of cutter (primary motion), 4 feed direction of work-part (secondary motion)

- Describe 3 work holding devices used on a milling machine.
- Describe with suitable illustrations, the appropriate use of 3 different types of cutting tools used for milling applications.
- The Slot- center-cutting tool which are generally two but can also be three or four with fluted cutters capable of drilling slots into a material
- Endmill- This type of milling tool has cutting teeth at one end and on the sides.
- Ballnose cutter- almost similar to slot drills but the ends of its cutters are hemispherical.

the three types of milling tools are shown below in order.

- Describe two different types of cutting tool materials and explain their suitability for different tasks. Produce a table showing 2 advantages and 2

disadvantages for each type of cutting tool materials and their cutting speeds used for mild steel, Brass and aluminum.

### **Some types of cutting tool materials include:-**

- Carbon Steel- Suitable for use with soft materials because it softens at temperatures above 2300

### **Part 3**

- Describe at least six important H&S factors when using a bench or pedestal drilling machine and explain how these factors can be used to reduce risk when machining components
- Operators should not wear loose clothing or jewellery to avoid entanglement
- Operators should wear goggles to protect eyes from debris and metal pieces
- Ensure that all guards are in place
- Use a properly sharpened drill bit
- Clamp work piece properly onto the bench
- Use correct working speeds with cutting fluids where possible to ensure work pieces do not overheat when being drilled.
- Describe the differences and advantages and disadvantages of a bench drill, a pillar drill and a radial arm drilling machine for different types of work
- Describe three work holding devices that may be used on a drilling machine. Produce a table showing two advantages and two disadvantages for each type of work holding device
- Describe with suitable illustrations a standard “ Jobber” HSS twist drill.

**The HSS standard twist drill is a special type of drilling bit used in the drilling of basic metal works.**

- Calculate using the correct formula, the correct speeds for the following drills and reamer using the materials shown.

- 10mm diameter drill-aluminum

Cutting Speed\*4Diameter of cutter= RPM

$$200 * 410 = 160 \text{ RPM}$$

- 15mm diameter drill-mild steel

Cutting Speed\*4Diameter of cutter= RPM

$$200 * 415 = 106.67 \text{ RPM}$$

- 25mm diameter drill -stainless steel

Cutting Speed\*4Diameter of cutter= RPM

$$200 * 425 = 32 \text{ RPM}$$

- 22mm diameter reamer-mild steel

$$200 * 422 = 36.36 \text{ RPM}$$